Role of Fuzzy Techniques in Performance Appraisal of Teaching Staff

G. A. Bhosale

Department of Computer Studies
Chh. Shahu Institute of Business Education and Research
Kolhapur, India

Dr. R. V. Kulkarni

Department of Computer Studies
Chh. Shahu Institute of Business Education and Research
Kolhapur, India

Abstract- **Every organization conduct performance appraisal of employees to measure their effectiveness. Performance appraisal is a method by which the job performance of an employee is evaluated. It is a part of career development which consists of regular reviews of employee performance within organizations. Educational institutes and universities carry out performance appraisals of teaching staff on regular intervals. The main purpose of performance appraisal is evaluation and development of employees. In Educational Institutes performance of a teacher is affected by various factors like teaching, student's feedbacks, use of innovative techniques in teaching learning process, research, publications. According to University Grant Commission's (UGC) notification approved by Govt. of Maharashtra State, the Academic Performance Indicators for teaching staff appraisal comprises all these mentioned factors. UGC's API grouped all these factors affecting teacher's performance into different categories [11]. While measuring performance of a teacher, Higher Educational Institutes should consider all these factors. There are many traditional ways to measure performance of employees. With the recent inventions in Information Technology more effective and efficient ways for performance measurement are available. Using soft computing techniques, effective measurement of teacher's performance is possible. Researchers all over the world are trying to use Fuzzy techniques to improve the effectiveness of performance appraisal. This paper is an attempt to highlight the role of Fuzzy Techniques in Measuring Performance of Teaching Staff for Appraisal.**

Keywords – Performance Appraisal, Teaching staff, Fuzzy Inference System, Membership Functions.

I. INTRODUCTION

In recent years different techniques evolve to measure performance of Employees. Researchers all over the world are continuously working on finding out efficient way to measure the performance of employee. Performance appraisal is a vital part of employee's career development. Various employment decisions like promotions, terminations, transfer depends upon the performance evaluation. Any business organization or Educational Institute has its own process of employee's performance appraisal. It is actually a systematic and periodic process that assesses an individual employee's job performance and productivity in relation to certain pre-established criteria and organizational objectives. In Higher educational Institutes or Universities performance of teachers is measured on the basis of certain factors like students feedback, teaching-learning and evaluation related activities, professional development activities like doing research work, attending national and international conferences, conducting and participating in workshops, publishing research articles and research papers. Again opinions of managements, colleagues, sub-ordinates also plays important role in performance measurement. All these factors are collectively used to evaluate a teacher's performance. The Teacher Performance Appraisal System provides teachers with meaningful appraisals that encourage professional learning and growth [7]. Recently soft computing approach like fuzzy logic is applied for effective measurement of teacher's performance by many researchers all over the world. Fuzzy theory was proposed by Dr. Lotfi Zadeh, a professor of mathematics from U.C. Berkeley. According to him fuzzy logic is to mimic the ability of the human mind to effectively employ modes of reasoning that are approximate rather than exact [2]. Fuzzy logic is based on Fuzzy set theory which is extension of classical set theory where elements have varying degrees of memberships [3]. Sometimes in describing human reasoning, a logic based on two truth values i.e. true and false is inadequate. Fuzzy logic uses entire interval between 0(false) and 1(true) to describe human reasoning. In Fuzzy Logic applications linguistic variables plays important role. Fuzzy logic is a mean to transform linguistic experience into mathematical information. Mostly human behaviors are based upon qualitative

facts, which cannot be measured numerically. Measuring teacher's performance focuses on such qualitative factors like teaching, learning, research, publications. Hence this problem can be handled by using Fuzzy approach in order to get better results than the conventional techniques.

II. REVIEW OF THE LITERATURE

Research and development in soft computing method reveal the highly efficient expert system, algorithms, and tools for the applications like teaching staff performance appraisal. A number of researchers focused on performance evaluation problems and they have different approach to solve this problem

A. Multi source feedback based performance appraisal system using Fuzzy logic decision support system – GMeenakshi

In this paper author's emphasis is on collecting multi-source feedback for performance appraisal. It is one of the modern methods for measuring employee's performance and referred as 360 degree feedback. The 360-degree feedback based appraisal is a comprehensive method where in the feedback about the employee comes from all the sources that come into contact with the employee on his/her job. Author used Fuzzy based Multifactorial Evaluation Model for decision making in performance appraisal. Multifactorial evaluation model is used in assisting high-level management, to appraise their employees. This proposed system is an attempt to implement multifactorial evaluation model based appraisal system in academics especially for engineering colleges.

B. Application of Expert System with Fuzzy Logic in Teacher's Performance Evaluation - Abdur Rashid Khan1, Hafeez Ullah Amin2, Zia Ur Rehman3

Authors of this paper proposed a model of fuzzy expert system to evaluate performance of teachers based on various key performances attributes which previously have been validated by subject experts. The proposed Expert System will not only be useful for decision-makers to evaluate teachers' abilities but may also be adopted in writing Annual Confidential Reports (ACR) of about all the employees of an organization. For implementation of fuzzy expert system, authors referred the knowledge acquisition tool based on 99 attributes which influence teacher's performance in higher education. These attributes are extracted from literature available and the divided into 15 groups. Then they received responses about effect of these factors on teaching performance from 25 highly qualified and well experienced subject experts from different universities of Pakistan. To map and control the input data values representing from absolute truth and absolute false, the fuzzy scale has been developed. Fuzzy expert system's model implements mapping of the qualitative variables into numeric result which provides a basis to use the system ranking for further decision making.

C. FUZZY EVALUATION METHOD USING FUZZY RULE APPROACH IN MULTICRITERIA ANALYSIS - Mahmod OTHMAN, Ku Ruhana KU-MAHAMUD, Azuraliza ABU BAKAR

This paper discusses the combination of quantitative methods using fuzzy set theory in analyzing multi-criteria teaching quality. For developing fuzzy model authors adopted the teaching quality dataset and factor weightage from [7]. For evaluation of teaching quality a new fuzzy model using multi-criteria analysis has been developed using 9 step algorithm implemented using C++ programming language. The main contribution of the research model was the usage of the fuzzy expert system consisting of set of rules in the form of IF (antecedent) THEN (Conclusion). Researchers propose the further steps to obtain a universal view on appropriate combination factors and the classification of mid-points, which could improve the performance of the proposed model.

D. EVALUATION OF TEACHER'S PERFORMANCE USING FUZZYLOGIC TECHNIQUES - SIRIGIRI PAVANI, P.V.S.S.GANGADHAR, KAJAL KIRAN GULHARE

In this paper, they have developed Fuzzy Inference System (FIS) to evaluate the performance of teacher with various input parameters and using two different membership functions triangular and trapezoidal. Further comparison of two different membership functions is done to achieve the shape of membership function. Result of both the membership functions shows that in both cases the performance in percentage is more or less same. A conclusion of this research is that the shape of membership function is not playing much role to evaluate the performance in positive or negative direction.

E. Fuzzy Inference System for Teaching Staff Performance Appraisal - G.A.Bhosale, R. S. Kamath

This paper emphasize on building performance evaluation model based on realistic data. The Fuzzy Inference System developed here is based on entering scores of teachers, related to different categories in Academic Performance Indicators (API) of UGC for performance appraisal. This FIS is actually a solution to qualitative assessment. In this system fuzzy rule base is developed which is related to different categories in API of UGC. In manual system user need to enter appropriate score for each category but here in Fuzzy Inference System membership function calculate the score based on logical reasoning.

F. Teacher Quality Evaluation in HEI Using a Fuzzy Logic - Bruno Trstenjak, Dzenana Donko

In this paper authors proposed a system for the multi-criteria decision making problem for ranking the teachers quality. For teacher's evaluation, the main emphasis is on analysis of the results of the student's survey and applying fuzzy logic to it. The approach adopted here is use of Fuzzy TOPSIS method. This method is used for multi-criteria decision making process. The methods for teacher quality evaluation are based on the crisp values of survey results and the calculation of the mean score of individual questions in the survey which often leads to similar or identical score in a large number of teachers. The Fuzzy TOPSIS method use setting priorities to each criterion gives the ability to accurately determine the differences between teachers quality.

G. Hierarchical Fuzzy Rule-Based Model for Teaching Performance Evaluation - Azizul Azhar Ramli and Nureize Arbaiy

For this research, authors designed a hierarchical Fuzzy Rule-Based (FRB) model for teaching evaluation process. A hierarchical model for teaching evaluation considers the possible factors that influence a teaching evaluation weigh age. This model is proposed for two primary purposes for implementing the teaching evaluation process, namely administration decision making and teaching improvement. The model emphasizes on the mapping of uncertainty data in performance measurement system which convert the data into fuzzy values that consist of labels and confidence values.

IV.CONCLUSION

Soft computing approach used by researchers all over the world can be viewed as foundation component for the emerging field of Conceptual Intelligence. Gradual assessment of membership of elements in a set, described with the help of a membership function valued in real unit interval [0, 1] is permitted by Fuzzy set theory. Problem of evaluating performance of teaching staff for the purpose of appraisal can be efficiently solved using Fuzzy Techniques. It is possible to develop Fuzzy Inference system which can be used to build performance evaluation models based on realistic data like UGC's Academic Performance Indicators (API) which will be useful for encouraging teaching staff.

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